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10/720,122	11/25/2003	Toshio Tsujimoto	245926US0XDIV	4386
22850 7590 09/02/2010 OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314				
EXAMINER SONG, MATTHEW J				
ART UNIT		PAPER NUMBER		
1714				
NOTIFICATION DATE		DELIVERY MODE		
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/720,122

Applicant(s)

TSUJIMOTO ET AL.

Examiner

MATTHEW J. SONG

Art Unit

1714

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 January 2010 and 08 June 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 27-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 27-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB-08)
Paper No(s)/Mail Date 6/3/2010
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Allowable Subject Matter

1. The indicated allowability of claims 27-34 is withdrawn in view of the new grounds of rejection. Rejections based on the new grounds of rejection follow.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 27-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hansen et al (US 5,980,629) in view of Watanabe et al (US 6,106,610) or Kemmochi et al (US 6,641,663).

In a method of forming a crucible for production of silicon single crystals, note entire reference, Hansen et al teaches a crucible has inner and outer coatings of a devitrification

promoter (col 3, ln 1-50 and col 4, ln 40-55). Hansen et al also teaches granular polycrystalline silicon is loaded into the crucible (col 3, ln 50-67) and the devitrification promoter is preferably barium, magnesium, strontium or beryllium (col 6, ln 20-5). Hansen et al also teaches devitrification promoters includes metal oxides, carbonates, oxalates and ion pairs of a metal cation and organic anions (col 6, ln 1-65), this clearly suggests applicant's metal salts, metal organic acid salt, and barium carbonate.

Hansen et al does not teach the crystallization promoter is dispersed in a silica matrix. Hansen et al is not particular about the method used to coat the surface of the crucible.

In a method of forming a crucible, note entire reference, Watanabe et al teaches a crystallization promoter can be used either alone or as a mixture with a powder of synthetic silicon dioxide to form a translucent (transparent) quartz glass layer (col 4, ln 1-35). Watanabe et al teaches depositing a synthetic silicon dioxide powder sufficiently impregnated with the aqueous solution, and the layer is formed as a coated film or a solid solution layer on the surface (col 3, ln 30-65 and col 4, ln 1-35), this clearly suggests a crystallization promoter dispersed in a silica matrix. Watanabe et al also teaches a crystallization promoter layer is fused to a base body (col 5, ln 5-30). Watanabe et al also teaches a transparent internal quartz layer (col 5, ln 55-67). Watanabe et al also teaches using a barium compound, such as barium oxide or barium hydroxide, as the promoter and the crystallization promoter concentration is 1×10^{-5} - 1×10^{-8} M/cm² (col 3, ln 1-40), which overlaps the claimed range.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Hansen et al by fusing the layer with a crystallization promoter dispersed in

a silica matrix to the base body as taught by Watanabe et al to improve adherence and improve safety by reducing the risk of inhalation and ingestion of the promoter ('629 col 8, ln 10-35).

In a method of forming a barium doped inner layer on a silica crucible, Kemmochi et al teaches a transparent inner layer **16** wherein the inner layer is doped with barium which crystallizes silica glass (col 5, ln 1-30 and col 6, ln 35-50). Kemmochi et al also teaches inner silica grain and a barium containing compound are placed in a hopper and mixed to ensure uniform distribution of the barium containing compound in the inner silica grain and the barium doped layer is formed by fusing barium in the silica glass, which clearly suggests a crystallization promoter is uniformly dispersed in a silica matrix (col 5, ln 50 to col 7, ln 10). Kemmochi et al also teaches the barium fused silica crucible can be cleaned or etched and handled with the same procedures as for normal silica crucibles with no additional post-manufacturing processing or special handling (col 7, ln 10), which clearly suggests the amount of crystallization promoter does not change with acid washing and has a mechanical strength of at least 6H.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Hansen et al by fusing the layer with a crystallization promoter dispersed in a silica matrix to the base body as taught by Kemmochi et al to enable fine concentration control of barium, and produce a barium fused silica crucible can be cleaned or etched and handled with the same procedures as for normal silica crucibles with no additional post-manufacturing processing or special handling (col 6, ln 30-67 and col 7, ln 1-10).

The combination of Hansen et al and Watanabe et al and the combination of Hansen et al and Kemmochi et al does not disclose the claimed method of obtaining the crucible by coating a

silica sol liquid comprising a metal salt and a partial hydrolyzate of alkoxysilane oligomer and burning a crucible coated with the silica sol liquid at 600-1000°C to form a transparent coated layer comprising a crystallization promoter derived from the metal salt, which is a product-by-process limitation and the patentability determination of a product-by-process claim is based on the patentability of the product and does not depend on its method of production (MPEP 2113). The combination of Hansen et al and Watanabe et al or the combination of Hansen et al and Kemmochi et al teaches a crucible, which meets all of the claimed product limitations (crucible with metal oxide promoter uniformly dispersed in a silica matrix) of claim 27. The same arguments apply for claims 28-31, which specify the liquid used to obtain the crystallization promoter layer. Also, the combination of Hansen et al and Kemmochi et al teaches barium carbonate ('663 col 5, ln 55-67).

As to the limitation regarding the amount of crystallization promoter is equal to or more than 1×10^{-9} to less than or equal to 1×10^{-6} mol/cm², the combination of Hansen et al and Watanabe et al teaches a concentration of 1×10^{-5} to 1×10^{-8} M/cm² ('610 claims 3 and 11). Overlapping ranges are prima facie obvious (MPEP 2144.05). The combination of Hansen et al and Kemmochi et al teaches 5-150 ppm ('663 col 9, ln 25-35) and concentration of the devitrification promoter is a result effective variable ('629 col 6, ln 30-65). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the combination of Hansen et al and Kemmochi et al by optimizing the concentration of barium by conducting routine experimentation of a result effective variable.

As to the limitation regarding the amount of crystallization promoter not changing upon acid washing, the combination of Hansen et al and Watanabe et al teaches a method of forming a

coated layer by dispersing a crystallization promoter within a silica matrix and fused to the crucible body ('610 col 5, ln 1-30); therefore the property is expected because a fused silica glass has a high mechanical strength and is resistant to acid washing. Furthermore, the combination of Hansen et al and Watanabe et al teaches the promoter is fused to the base body ('610 col 5, ln 5-30) and Kemmochi et al teaches that crucibles with barium fused in silica glass can be machined to dimensions, cleaned or etched, and handled with the same procedures as for normal pure silica crucibles ('663 col 1-30), which is evidenced that the properties would be expected for the crucible made according to the Watanabe process.

As to a crystallization promoter uniformly dispersed, the combination of Hansen et al and Kemmochi et al teaches a uniform distribution of barium in the silica grain ('663 col 5, ln 55-67). The combination of Hansen et al and Watanabe et al teaches silicon dioxide powder is impregnated with barium and a stirrer blade in the supply reservoir, which suggests a uniform distribution ('610 col 5, ln 1-20) because the materials are mixed. Furthermore, It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Hansen et al and Watanabe et al by dispersing the promoter uniformly to produce a promoter layer having uniform properties. The combination of Hansen et al and Kemmochi et al teaches a mixing blade can be used to ensure a uniform distribution of barium compound in a silica grain ('663 col 5, ln 50-67).

Referring to claims 32-34, the combination of Hansen et al and Watanabe et al and the combination of Hansen et al and Kemmochi et al teaches a crystallization promoter layer **24, 26** on the inside and outside surfaces of the crucible and polysilicon in the crucible. ('629 Fig 1 and col 12, ln 25-35).

Response to Arguments

4. Applicant's arguments with respect to claims 27-34 have been considered but are moot in view of the new ground(s) of rejection.

5. Applicant's arguments filed 1/21/2010 have been fully considered but they are not persuasive.

Applicant's arguments regarding claims 27-34 are noted but not found persuasive. Applicant's argument that Hansen et al teaches the coated layer is applied at less 600°C is noted but not persuasive because the instant claimed invention is a product claim. The patentability determination of a product-by-process claim is based on the patentability of the product and does not depend on its method of production (MPEP 2113). Here, the product is taught by the prior art. Watanabe et al teaches a method of forming a promoter layer by using silica grains and a barium promoter to the inner surface of a crucible. Also, Hansen et al is noted limited to any particular method of coating, thus the use of the Watanabe process would have been obvious for the reasons discussed above. Applicant also alleges that Hansen et al is limited to a burning temperature of less than 600°C.

Applicant's argument that when a coated layer is formed at a temperature below a melting point of silicon dioxide, it is assumed that the coated layer containing a crystallization promoter is not formed as a solid solution layer strongly adhering to the surface of the internal layer of the crucible is noted but not found persuasive. Applicant is merely alleging that the crystallization promoter layer is weakly adhered to the surface. However, Watanabe et al teaches

the crystallization promoter is contained in a silicon dioxide powder and fused with the base body (col 5, ln 1-30), which clearly suggests a strongly adhered crystallization layer because the crystallization layer is fused to the crucible.

Applicant's arguments that the coated layer with particular properties of the present invention formed at 600-1000°C and a temperature of more than 1200°C is unsuitable for the present invention is noted but not persuasive. Applicant alleges that it would be impossible to provide a coated layer with the properties of the present invention by the method disclosed by Watanabe et al. The claims are product by process claims. The patentability determination of a product-by-process claim is based on the patentability of the product and does not depend on its method of production (MPEP 2113). The product as claimed merely requires a crucible with a coated layer comprising metal oxide uniformly dispersed in a silica matrix, wherein the coated layer has a particular metal oxide amount and is resistant to acid washing. The metal oxide layer meets these claimed product properties for the reasons discussed above. Applicant is merely alleges differences without evidence; therefore the arguments are not persuasive.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. SONG whose telephone number is (571)272-1468. The examiner can normally be reached on M-F 11:00-7:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Kornakov can be reached on 571-272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew J Song
Examiner
Art Unit 1714

/Matthew J Song/
Examiner, Art Unit 1714